

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 18-22, 24-29 and 31-35 are in the case.

### **I. DECLARATION**

A new declaration has been required identifying the application by application number and filing date. An appropriate substitute executed declaration accompanies this response.

### **II. PRIORITY**

It is noted that the Action acknowledges receipt of the papers filed under 35 U.S.C. 119 (a)-(d) based on an application filed in China on 9 January 2004. The attached executed substitute declaration includes reference to the Chinese priority patent application.

### **III. SPECIFICATION**

The specification has been objected to as not containing customary headings. In response, the specification has been amended to include such headings, including a brief description of the drawing. In addition, a new Abstract is submitted herewith on a separate sheet, and a new title is presented. Withdrawal of the objection to the specification is respectfully requested.

**IV. THE FORMAL REJECTION**

Claims 25 and 31 are rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite. In response, the claims have been amended to present preferred features in new dependent claims, and to improve the form of the claims. No new matter is entered. Withdrawal of the formal rejection is respectfully requested.

**V. THE ANTICIPATION REJECTION**

Claims 17 and 30 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by Yamaguchi *et al.* (US 6,228,800 B1) (Yamaguchi). In response, and without conceding to the rejection, claims 17 and 30 have been canceled without prejudice. Withdrawal of the anticipation rejection is respectfully requested.

**VI. THE OBVIOUSNESS REJECTIONS**

Claims 18, 20, 21, 25-27 and 31 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yoshiyuki (JP 04349926) in view of Wells (US 3,918,927). Claim 19 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yoshiyuki in view of Wells and further in view of Yamaguchi *et al.* (US 6,228,800 B1) (Yamaguchi). Claim 22 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yoshiyuki in view of Wells and further in view of Yamamoto (US 3,458,409). Claims 23, 26, 28 and 29 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yoshiyuki in view of Wells and further in view of Blaha (US 3,353,982). Claim 24 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yoshiyuki in view of Wells and Blaha

and further in view of Webster's Third New International Dictionary. The rejections are respectfully traversed.

As claimed, there is provided a process for the preparation of a two layer metal palladium or palladium alloy composite membrane consisting of a porous substrate support and a palladium or palladium alloy membrane. The process comprises: 1) rinsing/washing and drying the porous substrate support, 2) treating the porous substrate support with a pore filler in order to decorate the pores of the support and the disfigurements of the substrate surface, 3) sensitizing and activating with a palladium solution the decorated substrate support, 4) plating the resulting support with a palladium solution to form the two layer composite membrane, 5) drying, and 6) subjecting the resulting composite membrane to a post-processing where the pore fillers residing in the pore-channels of the porous substrate are partly removed or reduced in volume through heating.

The invention provides a procedure for preventing the penetration of metal into the pores of the porous support during the deposition of the metal from electroless plating baths, where the auxiliary substances (pore fillers) are not completely removed after deposition of a metal layer, but transformed into porous substances through thermal treatment. This is achieved by preoccupying the pores of the support with the claimed modifiers prior to the deposition of the metal layer, which are transformed into a porous filler within the pores of the support by thermal treatment after the layer has been deposited. During the heat treatment, the pore filler partly decomposes and releases gaseous products e.g. CO, CO<sub>2</sub>, or H<sub>2</sub>O, which easily can escape from the porous support structure without causing damage to the deposited metal layer. It is to

be noted that these gaseous molecules are also typical components of the H<sub>2</sub>-containing gas streams, from which the H<sub>2</sub> is to be separated by means of the composite Pd membrane at temperatures up to 700 °C. It is an important characteristic of the present invention that the auxiliary substance at least partly stays behind in the support of the finished composite membrane and that the pore structure, the pore size, and the pore volume of the support are altered after deposition of the metal layer. In particular, the pore size of the support pores modified with the porous filler in the finished composite Pd membrane is in general smaller than the thickness of the deposited Pd layer.

Yoshiyuki describes the use of gels of silica, alumina or silica/alumina to modify the porous substrates. However, such gels are only used as a starting material because, after drying and firing, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, or Al<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> are formed, and the Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, or Al<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> are the real modifiers.

Yoshiyuki and the claimed invention differ in that Yoshiyuki discloses carrying out the drying and firing process prior to the formation of the metal layer. In contrast, the purpose of the presently claimed invention is to pre-occupy the pores of the substrates to prevent palladium deposition in the pores. The pore fillers employed in the presently claimed invention have such properties as being able to be reduced in volume through heating.

Thus, Yoshiyuki is different from and does not suggest the presently claimed invention in view of the drying and optional firing process which has to be carried out at different stages of the membrane preparation. In Yoshiyuki, this is carried out **prior** to

the formation of a separation layer while, according to the present invention, this is done **after** the formation of the metal membrane.

Wells is cited because of an alleged disclosure of conventional plating processes to produce a plated product having good adhesion of the metal plate thereto. Wells clearly does not cure the above-noted deficiencies of Yoshiyuki.

Based on the above, one of ordinary skill, as of the filing date of the present application, would not have been motivated to arrive at the presently claimed invention in view of Yoshiyuki, taken alone or in combination with Wells. Withdrawal of the obviousness rejection of claims 18, 20, 21, 25-27 and 31 over Yoshiyuki in view of Wells is respectfully requested.

Referring to the obviousness rejections of claim 19 over Yoshiyuki in view of Wells and Yamaguchi, claim 22 over Yoshiyuki in view of Wells and Yamamoto, claims 23, 26, 28 and 29 over Yoshiyuki in view of Wells and Blaha, and claim 24 over Yoshiyuki in view of Wells, Blaha and Webster's Third New International Dictionary, all of these rejected claims are dependent, either directly or indirectly, on claim 18 and thereby incorporate the features of claim 18 which are non-obvious in view of the combined disclosures of Yoshiyuki and Wells for the above-discussed reasons. The cited secondary art does not cure the deficiencies of Yoshiyuki and Wells, and does not give rise to a *prima facie* case of obviousness of the subject matter of the rejected dependent claims. Withdrawal of all of the obviousness rejections is accordingly respectfully requested.

HOU et al  
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Favorable action is awaited.

Respectfully submitted,

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